

IN THE CLAIMS:

Please cancel Claims 24 and 26 without prejudice to or disclaimer of the subject matter recited therein.

Please amend Claims 1 and 29 as follows.

1. (Currently Amended) A stereoscopic image displaying apparatus for providing, on a predetermined observing plane, parallax images each corresponding to left and right eyes of an observer, and making the observer capable of observing a stereoscopic image, said apparatus comprising:

an image display device for displaying a synthesized parallax image of a horizontal stripe obtained by alternately and perpendicularly arranging horizontal stripe images each of which is obtained by dividing in horizontal directions the parallax images each corresponding to left and right eyes of the observer;

an optical modulator which is located in front of said image display device and has a light transmitting section and a light shielding section so as to make the observer capable of observing parallax images for the left and right eyes included within the synthesized parallax image, at respective predetermined positions on the predetermined observing plane;

a first optical system for guiding display light transmitted through the light transmitting section of said optical modulator to the predetermined positions on the predetermined observing plane;

a second optical system for guiding display light from said image display

device to predetermined positions on a surface of said optical modulator on which the light transmitting section and the light shielding section are formed; and

an image forming device for controlling a subject to be displayed and positions of the light transmitting section and light shielding section of said optical modulator,

wherein said image forming device alternately switches between a first synthesized parallax image obtained by alternately arranging in the vertical direction each horizontal stripe image for the left and right eyes with a first order and a second synthesized parallax image obtained by alternately arranging in the vertical direction each horizontal stripe image for the left and right eyes with a second order which is opposite to the first order, and alternately displays the first and second synthesized parallax images on said image display device, and

said image forming device changes the position of the light transmitting section and the light shielding section of said optical modulator, the changes in position being synchronized with a timing for changing between the display of the first and second synthesized parallax images on said image display device,

said first optical system has a lenticular lens having a meridonal line direction that is vertical,

said second optical system has a lenticular lens having a meridonal line direction that is vertical and a lenticular lens having a meridonal line direction that is horizontal, in that order with respect to said first optical system, and

each of the lens elements of the lenticular lens having a meridonal line direction that is horizontal is respectively directed to each of the horizontal stripe images to

focus light from the horizontal stripe images onto said optical modulator as stripes.

2. (Cancelled)

3. (Cancelled)

4. (Previously Presented) A stereoscopic image displaying apparatus according to Claim 1, wherein said optical modulator uses a liquid crystal shutter that has pixels of a matrix structure or an oblong pixel structure.

5. (Cancelled)

6. (Withdrawn) A stereoscopic image displaying apparatus according to Claim 1, wherein  
said image ~~displaying~~ display device emits predetermined polarized light.

7. (Withdrawn) A stereoscopic image displaying apparatus according to Claim 6, wherein said optical modulator comprises:

a first phase shift member for giving two different phase shift states to transmitted light by an electric signal, and

a polarized optical element having a part for transmitting only predetermined polarized light among light transmitted through said first phase shift member.

8. (Withdrawn) A stereoscopic image displaying apparatus according to Claim 7, wherein said first phase shift member is arranged between said image displaying device and said second optical system.

9. (Withdrawn) A stereoscopic image displaying apparatus according to Claim 7, wherein

said polarized optical element is configured by alternately arranging two polarization plates on which optical axes are perpendicular to each other in the horizontal direction in a stripe pattern that is long in the vertical direction.

10. (Withdrawn) A stereoscopic image displaying apparatus according to Claim 7, 8, or 9, wherein

said polarized optical element comprises a second phase shift member and a polarizing plate, and its phase is processed as 0 and  $\pi$  in a pattern in which said second phase shift member is arranged in a checkered pattern or a stripe pattern that is long in the vertical direction.

11. (Withdrawn) A stereoscopic image displaying apparatus according to Claim 7, 8, or 9, wherein, said polarized optical element comprises:

a second phase shift member having a region providing  $\pi$  phase shift on the transmitted light and a region providing no phase shift on the transmitted light, and

a polarized plate having one polarized direction.

12. (Withdrawn) A stereoscopic image displaying apparatus according to Claim 6, wherein  
said image displaying device has an automatic light emission display apparatus and a polarizing plate.

13. (Previously Presented) A stereoscopic image displaying apparatus according to Claim 1, wherein among a parallax image for a left eye and a parallax image for a right eye, at least a part of the images respectively corresponding to each other do not have a respective parallax.

14. (Withdrawn) A stereoscopic image displaying apparatus according to Claim 1, wherein said second optical system substantially focuses, in the vertical direction, light from said image displaying device on the surface on which the light transmitting section and the light shielding section are formed by said optical modulator, and sets, in the horizontal direction, the surface on which the light transmitting section and the light shielding section are formed by said optical modulator as a substantial focal point position.

15. (Previously Presented) A stereoscopic image displaying apparatus according to Claim 1, wherein said first optical system and said second optical system have predetermined periodic structures in the horizontal direction, and are disposed so that centers of each optical element forming each of said first and said second optical system substantially coincide with an intersection point of straight lines which respectively

connect positions of a right and left pupil of an observer and positions of each pixel on said image displaying device.

16. (Previously Presented) A stereoscopic image displaying apparatus according to Claim 1, wherein

said second optical system has a predetermined periodic structure in the horizontal and vertical directions, respectively, and an optical element forming one period of said second optical system in the horizontal and vertical directions has optical actions that are different in the horizontal direction and the vertical direction.

17. (Cancelled)

18. (Previously Presented) A stereoscopic image displaying apparatus according to Claim 1, wherein

when the left and the right pupils are apart by an interval  $E$ , a period in the horizontal direction of the optical element forming said first optical system is  $HL1$ , a width in the horizontal direction of the light transmitting section of said optical modulator is  $Hm$ , a period in the horizontal direction of the optical element forming said second optical system is  $HL2$ , a pixel pitch in the horizontal direction of said image displaying device is  $Hd$ , optical distances between said first optical system and said second optical system and said first optical system and said image displaying device are  $LhL2$  and  $Lhd$ , respectively, an optical distance from the observation surface to said first optical system is  $Lh0$ , an

optical distance between said first optical system and light beam intersecting plane that is the first one counted from said first optical system in the direction to said image displaying device among light beam intersecting planes on which each beam connecting the left and the right pupils and each pixel of said image displaying device crosses is  $Lh1$ , an optical distance from said first optical system to a plane within said optical modulator on which the light transmitting section and the light shielding section are formed is  $Lh1a$ , an optical distance from the plane within said optical modulator to a light beam intersecting plane that is the first one counted from said first optical system in the direction to said image displaying device is  $Lh1b$ , and both  $Nd$  and  $NL2$  are integral numbers of 2 or more, the following relations are realized:

$$Nd \cdot HL1/E = Lhd/(Lhd + Lh0) \dots (h1)$$

$$Hd/HL1 = (Lh0 + Lhd)/Lh0 \dots (h2)$$

$$NL2 \cdot HL1/E = LhL2/(LhL2 + Lh0) \dots (h3)$$

$$HL2/HL1 = (Lh0 + LhL2)/Lh0 \dots (h4)$$

$$H1/E = Lh1/(Lh1 + Lh0) \dots (h5)$$

$$H1/HL1 = (Lh1 + Lh0)/Lh0 \dots (h6)$$

$$H1 \cdot Lh1a/Lh1 = HL1 \cdot Lh1b/Lh1 \dots (h7)$$

$$Lh1a + Lh1b = Lh1 \dots (h8)$$

$$Hm/H1 = Lh1a/Lh1 \dots (h9)$$

19. (Cancelled)

20. (Previously Presented) A stereoscopic image displaying apparatus according to Claim 1, wherein

when a pixel pitch in the vertical direction of said image displaying device is  $V_d$ , a width in the vertical direction of the light transmitting section or the light shielding section of said optical modulator is  $V_m$ , an optical distance from said image displaying device to a face having optical actions in the vertical direction of said second optical system is  $L_{v1}$ , an optical distance from a face having optical actions in the vertical direction of said second optical system to said a plane within said optical modulator on which the light transmitting section and the light shielding section are formed is  $L_{v2}$ , a focal distance in the vertical direction of each optical element forming said second optical system is  $f_v$ , and an optical distance between the plane within said optical modulator and an observation surface is  $L_{v0}$ , the following relations are realized:

$$V_d:V_m=L_{v1}:L_{v2} \dots (v1)$$

$$2 \cdot V_d:V_L=L_{v1}+L_{v2}:L_{v2} \dots (v2)$$

$$1/L_{v1}+1/L_{v2}=1/f_v \dots (v3)$$

$$V_d:V_L=L_{v0}+L_{v1}+L_{v2}:L_{v0}+L_{v2} \dots (v4)$$

21. (Cancelled)

22. (Previously Presented) A stereoscopic image displaying apparatus according to Claim 18, wherein

when a pixel pitch in the vertical direction of said image displaying device is



Vd, a width in the vertical direction of said the light transmitting section or the light shielding section of said optical modulator is Vm, an optical distance from said image displaying device to a face having optical actions in the vertical direction of said second optical system is Lv1, an optical distance from a face having optical actions in the vertical direction of said second optical system to a plane within said optical modulator on which the light transmitting section and the light shielding section are formed is Lv2, a focal distance in the vertical direction of each optical element forming said second optical system is fv, and an optical distance between the plane within said optical modulator and an observation surface is Lv0, the following relations are realized:

$$Vd:Vm=Lv1:Lv2 \dots (v1)$$

$$2 \cdot Vd:VL=Lv1+Lv2:Lv2 \dots (v2)$$

$$1/Lv1+1/Lv2=1/fv \dots (v3)$$

$$Vd:VL=Lv0+Lv1+Lv2:Lv0+Lv2 \dots (v4)$$

23. (Cancelled)

24. (Cancelled)

25. (Cancelled)

26. (Cancelled)

27. (Cancelled)

28. (Cancelled)

29. (Currently Amended) A stereoscopic image displaying apparatus for providing, on a predetermined observing plane, parallax images each corresponding to a plurality of viewpoints, and making an observer capable of observing a stereoscopic image, said apparatus comprising:

an image displaying device for displaying a synthesized parallax image of a horizontal stripe obtained by alternately and perpendicularly arranging horizontal stripe images each of which is obtained by dividing in horizontal directions the parallax images;

an optical modulator which is located in front of said image display device and has a light transmitting section and a light shielding section so as to make the observer capable of observing parallax images for the plurality of viewpoints included within the synthesized parallax image, at respective predetermined positions on the predetermined observing plane;

a first optical system for guiding display light transmitted through the light transmitting section of said optical modulator to the predetermined positions on the predetermined observing plane;

a second optical system for guiding display light from said image display device to predetermined positions on a surface of said optical modulator on which the light transmitting section and the light shielding section are formed; and

an image forming device for controlling a subject to be displayed and positions of the light transmitting section and light shielding section of said optical modulator,

wherein said image forming device makes a plurality of synthesized parallax images by arranging in the perpendicular direction each horizontal stripe image obtained from the plurality of [[of]] parallax images, with predetermined orders different from each other, and displays the plurality of synthesized parallax images on said image display device with a predetermined order for synthesized parallax images, and

said image forming device changes the position of the light transmitting section and the light shielding section of said optical modulator, the changes in position being synchronized with a timing for changing the display of the synthesized parallax images displayed on said image display device,

that said first optical system has a lenticular lens having a meridonal line direction is vertical,

said second optical system has a lenticular lens having a meridonal line direction that is vertical and a lenticular lens having a meridonal line direction that is horizontal, in that order with respect to said first optical system, and

each of the lens elements of the lenticular lens having a meridonal line directional that is horizontal is respectively directed to each of the horizontal stripe images to focus light from the horizontal stripe images onto said optical modulator as stripes.

30. (Cancelled)

31. (Previously Presented) A stereoscopic image displaying apparatus according to Claim 29, wherein said second optical system substantially focuses, in the perpendicular direction, light from said image displaying device on the surface on which the light transmitting section and the light shielding section are formed by said optical modulator, and sets, in the horizontal direction, the surface on which the light transmitting section and the light shielding section are formed by said optical modulator as a substantial focal point position.

32. (Previously Presented) A stereoscopic image display method for providing a stereoscopic image to an observer by using a stereoscopic image displaying apparatus according to Claim 1.

33. (Cancelled)

34. (Withdrawn) A stereoscopic image display method for providing a stereoscopic image to an observer by using a stereoscopic image displaying apparatus according to Claim 11.

35. - 38. (Cancelled)